leys and the southern Lake region and in parts of central and eastern Texas and the middle and west Gulf States. From the 12th to 15th a cool wave advanced from the Plateau over the Rockies, with minimum temperature 23° at Cheyenne, Wyo., the morning of the 14th. This is the lowest temperature on record for Cheyenne for so late a date in May. From the 15th to 17th heavy snow fell at points in the northern Rocky Mountain districts.

From the 18th to the 21st an area of low pressure that moved slowly eastward over the Gulf States and high pressure from the Lake region over the Canadian Maritime Provinces caused cool and unsettled weather generally over the eastern portion of the country, with heavy rains from Texas over the middle and east Gulf States that gradually extended over the south and middle Atlantic States and southern New England. During the 22d and 23d the center of the southern depression moved northeastward near the Atlantic coast attended by northeast gales from North Carolina to Maine.

A disturbance that moved from the middle plateau to the north Atlantic coast from the 22d to 28th was attended by heavy rains east of the Rockies. A severe and widespread barometric disturbance developed over the plateau region on the 27th and advanced over the Plains States and Mississippi Valley during the 28th and 29th, where it remained nearly stationary with a gradual loss of strength until the close of the month. The rain area that attended this storm extended from the middle and north Pacific coast over the middle and northern plateau and Rocky Mountain districts and covered the Plains and Gulf States and central valleys. During the 29–30th severe local storms occurred in the middle and west Gulf States, Oklahoma, and the Missouri Valley and well-defined tornados were reported the night of the 29th in North Dakota and in Brown County, Texas.

BOSTON FORECAST DISTRICT.

[New England.]

Temperature was generally below the seasonal average with much cloudy and unsettled weather and frequent showers. Snow flurries occurred in parts of the three northern States, but the only measurable amount was 5 inches at Jacksonville, Vt. No heavy wind storms occurred. Storm warnings were ordered on the 9th, 21st and 22d. Frost warnings were sent to cranberry growers on the 11th, and temperatures of freezing or below occurred in the cranberry growing sections on the morning of the 12th. There were no storms without warnings, and no frosts in the cranberry regions without warnings.—*J. W. Smith, District Forecaster.*

NEW ORLEANS FORECAST DISTRICT.*

[Louisiana, Texas, Oklahoma, and Arkansas.]

The month opened moderately cool and frosts occurred over the northern portion of the district on a few dates during the first decade, for all of which warnings had been issued. Precipitation was below normal during the first half and above normal during the latter half of the month. Storm warnings were issued for the west Gulf coast on the 5th and 8th. No general storms occurred without warnings.—*I. M. Cline, District Forecaster.*

LOUISVILLE FORECAST DISTRICT.*

[Kentucky and Tennessee.]

Temperature averaged below normal and the first three or four days were decidedly cold. Snow flurries occurred in northern Kentucky on the 1st and 2d. Frost was general over both States on those dates and considerable frost was reported on the morning of the 11th. After the 4th temperature was more seasonable, although there were several cool periods. Rains were frequent and thunderstorms numerous. Precipitation was considerably above normal in western Tennessee and averaged about normal over the rest of the district. Frost warnings were issued for the entire district on the mornings of the 1st and 10th.—*F. J. Walz, District Forecaster.*

CHICAGO FORECAST DISTRICT.*

[Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas, and Montana.]

The month opened with strong westerly winds and snow flurries on the upper lakes for which warnings were issued on the last of April. Warnings were again displayed on the 5th in anticipation of a storm that moved from the Rockies directly eastward. Warnings were hoisted on the 15th, 25th, and 30th as storms of considerable intensity approached the Lake region. No casualties of any kind during the month on the upper lakes have been reported, and it is probable that vessel men generally took advantage of the ample warnings given them. A few frost warnings were issued, but as the season was later than usual they were not of much importance.—*H. J. Cox, Prof. and District Forecaster.*

DENVER FORECAST DISTRICT.*

[Wyoming, Colorado, Utah, New Mexico, and Arizona.]

The month was colder than the average throughout the district, and freezing temperatures, for which timely and accurate warnings were issued, visited the agricultural districts. Precipitation was below normal except in northern Utah. The prevailing low temperatures prevented in a marked degree the melting of snow at high altitudes, and the streams rising near the Continental Divide discharged no unusual amounts. The Rio Grande, it is true, was at a high stage, beginning the 10th, as a result of the melting of snow in northwestern New Mexico, but temperatures were too low for the usual flow from the high mountains of southwestern Colorado. Timely warnings were issued for the high stage in the lower Rio Grande.—*F. H. Brandenburg, District Forecaster.*

SAN FRANCISCO FORECAST DISTRICT.†

[California and Nevada.]

The month was abnormally dry, and following an April almost without rain the season has been a remarkably dry one. Unusually heavy and continued rains in January, February, and March indicated a wet season. The snow covering in the mountains at the end of March was one of the deepest ever known; yet notwithstanding moist ground, full streams and deep snow cover there has practically been a cessation of precipitation throughout California since the end of March. There were no warm spells until the close of the month when temperatures exceeded 100° at Redlands, Riverside, Pasadena, San Bernardino, and other points in the San Gabriel valley. In the Sacramento and San Joaquin valleys afternoon temperatures reached 96°. No storm and no frost warnings were issued during the month.—*A. G. McAdie, Prof. and District Forecaster.*

PORTLAND, OREGON, FORECAST DISTRICT.†

[Oregon, Washington, and Idaho.]

The month was cooler than usual and the rainfall though deficient was well distributed. Warnings were issued in time to be of benefit for the only storm of sufficient strength to justify them. Warnings were issued a day ahead for all damaging and widespread frosts. Notwithstanding there was more snow in the mountains at the end of the month than usual the Columbia River did not begin to rise materially until the last two days. Prior to this time the stages in the lower Columbia were the lowest on record for the month of May.—*E. A. Beals, District Forecaster.*

RIVERS AND FLOODS.

Floods occurred during the month in the Allegheny River, the Grand River of Michigan, the Mississippi River between the mouth of the Des Moines River and Hannibal, Mo., the lower Arkansas watershed, central and southeastern Mississippi, western Alabama, the rivers of South Carolina and in the lower Roanoke River. The majority were unimportant,

* Morning forecasts made at district center; night forecasts made at Washington, D. C.

† Morning and night forecasts made at district center.

but those in the lower Arkansas and the rivers of southern Mississippi and western Alabama were very pronounced and destructive, especially in southern Mississippi.

The flood in the lower Arkansas River and tributaries was caused by the heavy rains of May 23 and 24, and flood stages were reached generally on May 25. The crest stage at Fort Smith, Ark., was 26.6 feet on May 27, 4.6 feet above the flood stage; at Little Rock, Ark., 23.5 feet, on May 29, 0.5 foot above flood stage; and at Pine Bluff, Ark., 27.0 feet, on May 30, 2.0 feet above flood stage. The losses amounted to about $300,000, of which two-thirds was in crops, while the value of property saved by the flood warnings was about $60,000. Damage to lands by erosion amounted to about $12,000.

The southern Mississippi and Tombigbee River floods resulted from the excessive rains that began about May 24, and before they subsided in early June some very high stages had been recorded. At Jackson, Miss., on the Pearl River the crest stage was 35.3 feet on May 30, 15.3 feet above the flood stage; at Columbia, Miss., 27.0 feet on June 5, 7.0 feet above the flood stage; at Enterprise, Miss., on the Chichasawhay River, 36.0 feet on May 27, 18.0 feet above flood stage and the highest water of record; at Merrill, Miss., on the Pascagoula River, 25.1 feet on June 4, 5.1 feet above flood stage; at Demopolis, Ala., on the Tombigbee River, 51.1 feet on June 11, 16.1 feet above the flood stage; and at Tuscaloosa, Ala., on the Black Warrior River, 51.6 feet on June 5.

About 70,000 acres of lowlands along the Black Warrior and Tombigbee rivers were inundated, and the losses in Alabama and Mississippi amounted to about $980,000, divided as follows:

Crops	$600,000
Property other than crops	150,000
Damage to farm lands	30,000
Suspension of business	200,000
Total	$980,000

The value of the property saved through the Weather Bureau warnings was about $55,000, a small amount when compared with the losses, but representing nevertheless, all that there was to save at this season of the year.

The losses during the Allegheny River flood on May 1 and 2 amounted to $65,000, and the value of property saved by the Weather Bureau warnings was about $75,000.

The annual rise of the Missouri and Columbia rivers set in during the month, but no flood stages were reported. The Ohio River rise resulted in stages close to the flood stage, and on May 13 passed into the Mississippi River, where the crest stages were also close to the flood stage. At the end of the month the river was still rising at New Orleans, La. The upper Mississippi River was comparatively quiet at stages that are to be expected at this time of the year.

The highest and lowest water, mean stage, and monthly range at 217 river stations are given in Table IV. Hydrographs for typical points on seven principal rivers are shown on Chart I. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississipi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Professor of Meteorology.*

SPECIAL ARTICLES, NOTES, AND EXTRACTS.

A BALLOON AMONG THUNDERSTORMS.

By CHARLES J. GLIDDEN. Dated Pittsfield, Mass., May 25, 1909.

Aeronauts in the balloon *Massachusetts* that ascended from Pittsfield on the afternoon of May 24, 1909, had an unusual experience. At an elevation of one mile and thirty minutes after the start, three showers and thunderstorms were noticed, one in the Hoosic Valley, another in the Connecticut, and the third near Worcester. The balloon rose and fell through intervals varying from 1,000 to 10,000 feet, and several times was caught in varying currents which caused the basket to turn and swing from side to side. Under one mile elevation the balloon traveled in advance of one of the storms at a speed of about forty miles an hour, while at an elevation of 10,000 feet calm and sunshine prevailed with the storm rapidly passing below them. Lightning flashes were frequent and heavy peals of thunder shook the basket. After the storms had passed under the balloon a rift in the clouds enabled the aeronauts to drop down into a clearing free from clouds and to make a landing without difficulty. This established the fact that above the storm there existed bright sunshine and no wind.

THE 24-HOUR DAY.

By CHAS. A. MIXER, C. E. Dated Rumford Falls, Me., July 17, 1909.

The letter from Mr. Clayton in the March number of the REVIEW, dated June 28 and received to-day, viz, on the adoption of the Kelvin thermometer scale and the metric system, interests me. I wish to approve his recommendation and to add a suggestion intended to complete the recommendation. Really it is a repetition rather than a suggestion, for I have written of it before, but not recently. It is, Adopt the 24-hour time. For seventeen years I have been using the 24-hour day; not alone in my weather records but primarily in all the hydraulic and electric records of our business. It is very easy for even untrained workmen to adopt and use the 24-hour time, and to use it with less error than the 12 hours with A. M. and P. M. With the 24-hour system, "10:40 hr." can mean only one time in the day. It is as easy to write and to think "16-hr." as it is "4 P. M."

Within two weeks I have read in the newspapers that the Russian Government has adopted the 24-hour time. I do not now remember the paper and can name no authority, but I was glad to read of the adoption.

A SIMPLE APPLICATION OF THE THEORY OF PROBABILITIES TO WEATHER PREDICTION.

By C. E. VAN ORSTRAND. Dated Washington, D. C., June 15, 1909.

In the present state of meteorological science, it is recognized that precise predictions of weather conditions for moderate intervals of time are impossible. This imperfection of the science is due to many causes, the most important of which is the uncertainty in both velocity and direction of the approaching storm. Since the forecaster must necessarily take these and other uncertainties into account, it would seem that the most logical method of procedure would be to state the prediction in terms of probabilities in order that the forecaster may more accurately take into account the various factors of the problem; and thus be able to give to the public, in a definite statement, all of the specific information which science is capable of yielding for a particular weather condition; and no more.

This requirement may be met, in a way, by stating the prediction in terms of two scales, each on a basis of 10. On the first scale is represented the probability of the predicted phenomena, and on the second, the estimated amount or intensity. Suppose, for example, that a prediction is to be made on the rainfall in a given area. The maximum rainfall in twenty-four hours is represented by 10 on the second scale of the diagram (Fig. 1); one-half the maximum by 5, and so on to 0, which means no precipitation. On the probability scale, 10 means certainty, probability unity; 5 means an even chance,